AMENDMENTS TO THE DRAWINGS:

The attached sheets of Drawings include changes to Figs. 9 to 21 and 38A to 39C. These sheets, which include Figs. 8 to 39C, replace the original sheets including Figs. 8-39C.

Attachment: Eight (8) Replacement Sheets.

REMARKS/ARGUMENTS

Claims 23-42 are pending in this application. By this Amendment, Applicant cancels Claim 22 and amends the specification, the drawings, and Claims 23-31, 34, 35, and 42.

The drawings were objected to because they included various reference characters that were not mentioned in the specification. Applicant has amended the specification to mention reference characters 43 and 44, and has amended the drawings to remove the remaining reference characters not mentioned in the specification. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this objection.

Claims 22-28, 31, 33, and 35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. (U.S. 2002/0158549) in view of Taniguchi (U.S. 2001/0008387). Claim 29 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, and further in view of Takayama et al. (U.S. 2004/0174233). Claim 30 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, and further in view of Takamine (U.S. 2002/0135267). Claim 34 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, and further in view of Nakahata et al. (U.S. 6,025,636). Claims was rejected 32, 36-38, and 41 under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, and further in view of Nishiyama et al. (U.S. 2007/0132339). Claims 39 and 40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi and Nishiyama et al., and further in view of Mishima et al. (U.S. 2005/0099091). Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi, and further in view of Kadota et al. (U.S. 5,260,913). Claim 22 has been canceled. Applicant respectfully traverses the rejections of claims 23-42.

Claim 29 has been amended to recite:

> A boundary acoustic wave device using a non-leaky propagation

type boundary acoustic wave, comprising:
a plurality of boundary acoustic wave elements, each boundary acoustic wave element including a single crystal substrate, a solid layer provided on the single crystal substrate, and electrodes arranged at a boundary between the single crystal substrate and the solid layer; wherein
the single crystal substrates have a same cut angle; and
a propagation direction of a boundary acoustic wave of at least one of the boundary acoustic wave elements is different from that of at least one of the other boundary acoustic wave elements; and
a thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate.
(emphasis added)

With the unique combination and arrangement of features recited in Applicant's Claim 29, including the feature of "a thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate," Applicant has been able to provide a boundary acoustic wave device in which the electromechanical coefficient, which is a main response of an SH boundary acoustic wave, is large, the transmission loss and the power flow angle are small, and a spurious signal caused by a Stoneley wave in the vicinity of the main response is small (see, for example, paragraph [0015] of Applicant's Substitute Specification).

The Examiner alleged that the combination of Itakura et al., Taniguchi, and Takayama et al. teaches all of the features recited in Applicant's Claim 29. The Examiner acknowledged that neither Itakura et al. nor Taniguchi teaches or suggests that the thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave

propagating through the piezoelectric single crystal substrate. The Examiner alleged that Takayama et al. teaches this feature. Thus, the Examiner concluded that it would have been obvious "to combine the electrode thickness of Takayama et al. with the boundary acoustic wave device of Itakura et al. as modified by Taniguchi for the benefit of reducing the propagation loss." Applicant respectfully disagrees.

Contrary to the Examiner's allegations, none of Itakura et al., Taniguchi, and Takayama et al. teaches or suggest any boundary acoustic wave devices. To the contrary, each of Itakura et al., Taniguchi, and Takayama et al. discloses only surface acoustic wave devices. Thus, Itakura et al., Taniguchi, and Takayama et al. clearly fail to teach or suggest the features of "a plurality of boundary acoustic wave elements, each boundary acoustic wave element including a single crystal substrate, a solid layer provided on the single crystal substrate, and electrodes arranged at a boundary between the single crystal substrate and the solid layer" as recited in Applicant's Claim 29.

In addition, the Examiner alleged that paragraphs 8 and 83 of Takayama et al. teach the feature of "a thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate." However, paragraphs 8 and 83 of Takayama et al. disclose:

> To overcome this problem, use of a substrate with a larger cut-angle is effective for substantial reduction of propagation loss. This idea is disclosed in Japanese Patent Application Non-Examined Publication No. H09-167936. According to this publication, the cut-angle of the substrate, which minimizes the propagation loss of the LSAW propagating on the LT single-crystal and LN single-crystal, varies in response to normalized film-thickness h/λ of the IDT electrode, where h=film thickness of the electrode, and λ=wavelength of the SAW. In the case of the LT single-crystal, when the film thickness of the IDT electrode becomes 0.03-0.15 of the wavelength of the LSAW (normalized film thickness h/.lambda. is 3%-15%), a shift of the cut-angle from 36° to 39°-46° can almost eliminate the

> propagation loss. In the same manner, in the case of the LN single-crystal, when the film thickness of the IDT electrode becomes 0.03-0.15 of the wavelength of the LSAW (normalized film thickness h/.lambda. is 3%-15%), a shift of the cut-angle from 64° to a greater angle, such as 66°-74°, can reduce the propagation loss to almost 0 (zero).
>
> A saw resonator as comparison sample 1 has the following specifications: pitch "p" of finger-electrodes 301 is 1.06 μm, and normalized film thickness h/λ is 6.0%. Another SAW resonator as comparison sample 2 has the following specifications: pitch "p" of finger-electrodes 301 is 1.0 μm, and normalized film thickness h/λ is 11%. Those samples have resonance frequencies of 1886.0 MHz (comparison sample 1) and 1884.9 MHz (comparison sample 2). The acoustic velocities of those comparison samples can be found by equation (1) and with their resonance frequencies f, comparison sample 1 has an acoustic velocity of 3998.3 m/s, and comparison sample 2 has an acoustic velocity of 3769.8 m/s. Those velocities are faster than the phase velocity of the slow shear wave propagating on the 39° Y-XLT substrate used in this first embodiment. On top of that, both of those two comparison samples do not satisfy the relation of $2xp \leq vb/f$.

Neither these portions nor any other portions of Takayama et al. teach or suggest anything at all about an acoustic velocity of an **SH type boundary acoustic wave** relative to acoustic velocities of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate. In fact, as noted above, Takayama et al. is not even directed to a **boundary acoustic wave** device. Instead, Takayama et al. is specifically directed to a **surface acoustic wave** device, **NOT a boundary acoustic wave** device, and Takayama et al. neither teaches or suggests that the structure disclosed therein could or should be used for a boundary acoustic wave device.

At best, Takayama et al. merely teaches that the acoustic velocity of a leaky surface acoustic wave should be slower than a slow shear wave propagating on the substrate. Takayama et al. fails to teach or suggest any relationship whatsoever between the acoustic wave of the surface acoustic wave and the acoustic velocity of a slow shear wave propagating through a solid layer. In fact, since Takayama et al.

teaches a surface acoustic wave device, not a boundary acoustic wave device, there would not be any slow shear wave propagating through a solid layer.

Thus, contrary to the Examiner's allegations, Takayama et al. clearly fails to teach or suggest the feature of "a thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate" as recited in Applicant's Claim 29.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claim 29 under 35 U.S.C. § 103(a) as being unpatentable over Itakura et al. in view of Taniguchi and Takayama et al.

The Examiner relied upon Takamine, Nakahata et al., Nishiyama et al., Mishima et al. and Kadota et al. to allegedly cure various deficiencies of Itakura et al., Taniguchi, and Takayama et al. However, Takamine, Nakahata et al., Nishiyama et al., Mishima et al. and Kadota et al. fail to teach or suggest the feature of "a thickness of the electrodes is set so that the acoustic velocity of an SH type boundary acoustic wave is lower than the acoustic velocity of a slow transverse wave propagating through the solid layer and the acoustic velocity of a slow transverse wave propagating through the piezoelectric single crystal substrate" as recited in Applicant's Claim 29. Thus, Applicant respectfully submits that Takamine, Nakahata et al., Nishiyama et al., Mishima et al. and Kadota et al. fail to cure the deficiencies of Itakura et al., Taniguchi, and Takayama et al. described above.

Accordingly, Applicant respectfully submits that Itakura et al., Taniguchi, Takayama et al., Takamine, Nakahata et al., Nishiyama et al., Mishima et al. and Kadota et al., applied alone or in combination, fail to teach or suggest the unique combination and arrangement of features recited in Applicant's Claim 29.

In view of the foregoing amendments and remarks, Applicant respectfully submits that Claim 29 is allowable. Claims 23-28 and 30-42 depend upon Claim 29, and are

therefore allowable for at least the reasons that Claim 29 is allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Dated: April 24 ,2008

/Christopher A. Bennett, #46,710/
Attorneys for Applicant

KEATING & BENNETT, LLP
8180 Greensboro Drive, Suite 850
Tyson's Corner, VA 22102
Telephone: (703) 637-1480
Facsimile: (703) 637-1499

Joseph R. Keating
Registration No. 37,368

Christopher A. Bennett
Registration No. 46,710